

PATENT APPLICATION SERIAL NO. _____

U.S. DEPARTMENT OF COMMERCE
PATENT AND TRADEMARK OFFICE
FEE RECORD SHEET

05/25/2001 HLE333 00000053 09863504

01 FC:101 710.00 DP
02 FC:104 270.00 DP

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MAY 25 2001
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05/23/01



JC882 U.S. PTO

BAKER BOTTS LLP

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09/863504

05/23/01

UTILITY
PATENT APPLICATION
TRANSMITTAL

(Only for new nonprovisional applications under 37 CFR 1.53(b))

Attorney Docket No.	A34202
First Inventor	Hiroji Kawasaki
Title	RECOIL FUEL * see attached
Express Mail Label No.	EF321688699US

APPLICATION ELEMENTS

See MPEP chapter 600 concerning utility patent application contents.

1. ☒ Fee Transmittal Form (e.g., PTO/SB/17)
(Submit an original and a duplicate for fee processing)
2. ☐ Applicant claims small entity status.
See 37 CFR 1.27.
3. ☒ Specification [Total Pages **8**]
(preferred arrangement set forth below)
 - Descriptive title of the invention
 - Cross Reference to Related Applications
 - Statement Regarding Fed sponsored R & D
 - Reference to sequence listing, a table, or a computer program listing appendix
 - Background of the Invention
 - Brief Summary of the Invention
 - Brief Description of the Drawings (if filed)
 - Detailed Description
- ☒ Claim(s) [Total Sheets **1**]
- ☒ Abstract of the Disclosure [Total Sheets **1**]
4. ☒ Drawing(s) (35 U.S.C. 113) [Total Sheets **3**]
5. Oath or Declaration [Total Pages **4**]
 - a. ☒ Newly executed (original or copy)
Copy from a prior application (37 CFR 1.63 (d))
(for continuation/divisional with Box 18 completed)
 - b. ☐ **DELETION OF INVENTOR(S)**
Signed statement attached deleting inventor(s)
named in the prior application, see 37 CFR 1.63(d)(2) and 1.33(b).
6. ☐ Application Data Sheet. See 37 CFR 1.76

ADDRESS TO:

Assistant Commissioner for Patents
Box Patent Application
Washington, DC 20231

7. ☐ CD-ROM or CD-R in duplicate, large table or Computer Program (Appendix)
8. Nucleotide and/or Amino Acid Sequence Submission (if applicable, all necessary)
 - a. ☐ Computer Readable Form (CRF)
 - b. Specification Sequence Listing on:
 - i. ☐ CD-ROM or CD-R (2 copies); or
 - ii. ☐ paper
 - c. ☐ Statements verifying identity of above copies

ACCOMPANYING APPLICATION PARTS

9. ☒ Assignment Papers (cover sheet & document(s))
10. ☐ 37 CFR 3.73(b) Statement (when there is an assignee) ☒ Power of Attorney
11. ☐ English Translation Document (if applicable)
12. ☐ Information Disclosure Statement (IDS)/PTO-1449 ☐ Copies of IDS Citations
13. ☐ Preliminary Amendment
14. ☒ Return Receipt Postcard (MPEP 503) (Should be specifically itemized)
15. ☒ Certified Copy of Priority Document(s) (if foreign priority is claimed)
16. ☐ Request and Certification under 35 U.S.C. 122 (b)(2)(B)(i). Applicant must attach form PTO/SB/35 or its equivalent.
17. ☐ Other:

18. If a CONTINUING APPLICATION, check appropriate box, and supply the requisite information below and in a preliminary amendment, or in an Application Data Sheet under 37 CFR 1.76:

☐ Continuation ☐ Divisional ☐ Continuation-in-part (CIP)

of prior application No.:

Prior application information:

Examiner:

Group Art Unit:

For CONTINUATION OR DIVISIONAL APPS only: The entire disclosure of the prior application, from which an oath or declaration is supplied under Box 5b, is considered a part of the disclosure of the accompanying continuation or divisional application and is hereby incorporated by reference. The incorporation can only be relied upon when a portion has been inadvertently omitted from the submitted application parts.

19. CORRESPONDENCE ADDRESS

☒ Customer Number or Bar Code Label

21003

(Insert Customer No. or Attach bar code label here)

or ☐ Correspondence address below

Name

Address

City

State

Zip Code

Country

Telephone

Fax

Name (Print/Type)

Ronald B. Hildreth

Registration No. (Attorney/Agent)

19,498

Signature

Date

5-23-01

Addendum Sheet 1***Question 4 Addendum**

4.a. Drawings are ☒ formal ☐ informal

*** Question 5 Addendum**

5.c. ☐ An unsigned oath or declaration is included.

*** Question 8 Addendum**

8.d. ☐ A sequence submission will follow.

*** Question 9 Addendum**

9.a. ☐ Assignment documents will follow.

9.b. ☐ Assignment documents have been filed in parent application No.

*** Question 11 Addendum**

11.a. ☐ English translation will follow.

*** Question 12 Addendum**

12.a. ☐ Copies of IDS citations will follow.

*** Question 15 Addendum**

15.a. ☐ Certified copies of priority documents will follow.

15.b. ☐ Certified copies of priority documents have been filed in parent application No.

Use the space below for additional information

Inventors - Hiroji Kawasaki and Junichi Akaike

Title (continued):

RECOIL FUEL STARTER

Addendum Sheet 2

18a. If a CONTINUING APPLICATION, check appropriate box, and supply the requisite information below and in a preliminary amendment, or in an Application Data Sheet under 37 CFR 1.76:

☐ Continuation ☐ Divisional ☐ Continuation-in-part (CIP) of prior application No.: _____
 Prior application information: Examiner: _____ Group Art Unit: _____

18b. If a CONTINUING APPLICATION, check appropriate box, and supply the requisite information below and in a preliminary amendment, or in an Application Data Sheet under 37 CFR 1.76:

☐ Continuation ☐ Divisional ☐ Continuation-in-part (CIP) of prior application No.: _____
 Prior application information: Examiner: _____ Group Art Unit: _____

18c. If a CONTINUING APPLICATION, check appropriate box, and supply the requisite information below and in a preliminary amendment, or in an Application Data Sheet under 37 CFR 1.76:

☐ Continuation ☐ Divisional ☐ Continuation-in-part (CIP) of prior application No.: _____
 Prior application information: Examiner: _____ Group Art Unit: _____

☐ Amend the specification by inserting before the first line the sentence(s)

☐ "This application is a ☐ Continuation ☐ Divisional ☐ Continuation-in-part (CIP) of:

☐ "This application is based upon:

prior application No.: _____, incorporated by reference herein,

☐ which is a ☐ Continuation ☐ Divisional ☐ Continuation-in-part (CIP) of:

☐ which is based upon:

prior application No.: _____, incorporated by reference herein,

☐ which is a ☐ Continuation ☐ Divisional ☐ Continuation-in-part (CIP) of:

☐ which is based upon:

prior application No.: _____, incorporated by reference herein,

☐ which is a ☐ Continuation ☐ Divisional ☐ Continuation-in-part (CIP) of:

☐ which is based upon:

prior application No.: _____, incorporated by reference herein,

☐ which is a ☐ Continuation ☐ Divisional ☐ Continuation-in-part (CIP) of:

☐ which is based upon:

prior application No.: _____, incorporated by reference herein,

☐ which is a ☐ Continuation ☐ Divisional ☐ Continuation-in-part (CIP) of:

☐ which is based upon:

prior application No.: _____, incorporated by reference herein

Priority under 35 U.S.C. §119 is claimed based upon the following applications.

Foreign Applications:

Country: Japan

Serial No: 153757/2000

Filing Date: May 24, 2000

Country: _____

Serial No: _____

Filing Date: _____

Country: _____

Serial No: _____

Filing Date: _____

Provisional Applications:

Serial No: _____

Filing Date: _____

Serial No: _____

Filing Date: _____

Serial No: _____

Filing Date: _____

FEE TRANSMITTAL for FY 2001

Patent fees are subject to annual revision.

TOTAL AMOUNT OF PAYMENT

(\$ 1,020

Complete if Known

Application Number

Filing Date

First Named Inventor

Hiroji Kawasaki

Examiner Name

Group Art Unit

Attorney Docket No.

A34202

METHOD OF PAYMENT

1. ☒ The Commissioner is hereby authorized to charge indicated fees and credit any overpayments to:

Deposit
Account
Number

02-4377

Deposit
Account
Name

Baker Botts LLP

- ☒ Charge Any Additional Fee Required
Under 37 CFR 1.16 and 1.17

- ☐ Applicant claims small entity status.
See 37 CFR 1.27

2. ☒ Payment Enclosed:

- ☒ Check ☐ Credit card ☐ Money
Order ☐ Other

FEE CALCULATION

1. BASIC FILING FEE

Large Entity Small Entity

Fee (\$)	Fee (\$)	Fee Description	Fee Paid
710	355	Utility filing fee	710
320	160	Design filing fee	
490	245	Plant filing fee	
710	355	Reissue filing fee	
150	75	Provisional filing fee	

SUBTOTAL (1) (\$ 710

2. EXTRA CLAIM FEES

Total Claims	Extra Claims	Fee from below	Fee Paid
12	.20** = 0	0	0
Independent Claims	1	-3** = 0	0
Multiple Dependent		270	270

Large Entity Small Entity

Fee (\$)	Fee (\$)	Fee Description
18	9	Claims in excess of 20
80	40	Independent claims in excess of 3
270	135	Multiple dependent claim, if not paid
80	40	** Reissue independent claims over original patent
18	9	** Reissue claims in excess of 20 and over original patent

SUBTOTAL (2) (\$ 270

**or number previously paid, if greater; For reissues, see above

FEE CALCULATION (continued)

3. ADDITIONAL FEES

Large Entity Fee (\$)	Small Entity Fee (\$)	Fee Description	Fee Paid
130	65	Surcharge - late filing fee or oath	
50	25	Surcharge - late provisional filing fee or cover sheet	
130	130	Non-English specification	
2,520	2,520	For filing a request for <i>ex parte</i> reexamination	
920*	920*	Requesting publication of SIR prior to Examiner action	
1,840*	1,840*	Requesting publication of SIR after Examiner action	
110	55	Extension for reply within first month	
390	195	Extension for reply within second month	
890	445	Extension for reply within third month	
1,390	695	Extension for reply within fourth month	
1,890	945	Extension for reply within fifth month	
310	155	Notice of Appeal	
310	155	Filing a brief in support of an appeal	
270	135	Request for oral hearing	
1,510	1,510	Petition to institute a public use proceeding	
110	55	Petition to revive - unavoidable	
1,240	620	Petition to revive - unintentional	
1,240	620	Utility issue fee (or reissue)	
440	220	Design issue fee	
600	300	Plant issue fee	
130	130	Petitions to the Commissioner	
50	50	Processing fee under 37 CFR 1.17(q)	
180	180	Submission of Information Disclosure Stmt	
40	40	Recording each patent assignment per property (times number of properties)	40
710	355	Filing a submission after final rejection (37 CFR § 1.129(a))	
710	355	For each additional invention to be examined (37 CFR § 1.129(b))	
710	355	Request for Continued Examination (RCE)	
900	900	Request for expedited examination of a design application	

Other fee (specify) _____

*Reduced by Basic Filing Fee Paid

SUBTOTAL (3) (\$ 40

SUBMITTED BY

Name (Print/Type)

Ronald B. Hildreth

Signature

Ronald B. Hildreth

Registration No.
(Attorney/Agent)

19,498

Complete (if applicable)

Telephone

212-408-2544

Date

May 23, 2001

ABSTRACT

A recoil starter includes a rotary driving member that is adapted to be rotated by pulling a recoil rope and an interlocking rotary member that is adapted to be rotated independently of the rotary driving member. A buffering spring is coupled between the rotary driving member and the interlocking rotary member. The buffering spring, which may be a torsion coil spring or a spiral spring, applies a rotational bias between the rotary driving member and the interlocking rotary member and is adapted to transmit the rotation of the rotary driving member to the interlocking rotary member.

RECOIL STARTER

BACKGROUND OF THE INVENTION

[0001] The present invention relates to a recoil starter for an internal combustion engine and, in particular, to a recoil starter that allows fluctuations in the pulling force of a recoil rope to be reduced.

[0002] The recoil starters conventionally used for small internal combustion engines usually have a rope reel that is rotated by pulling a recoil rope that is wound onto the rope reel and fitted with a handle. The resulting rotation of the rope reel is transmitted by, for example, a centrifugal ratchet mechanism, to the crankshaft of the internal combustion engine, thereby "start up" the internal combustion engine.

[0003] In the case of an internal combustion engine which is provided with such a recoil starter, a decompressor is frequently attached to the internal combustion engine in order to minimize the pulling force (rope pulling force) of the recoil rope that is required for starting the internal combustion engine.

[0004] It is required, in the case of the conventional recoil starter described above, to strongly and quickly pull the recoil rope in order to start up the internal combustion engine. Furthermore, although it is possible to rotate the crankshaft by pulling the recoil rope, it has been impossible to obtain a smooth rope-pulling operation due to large fluctuations of the load imposed on the recoil rope by the engine, i.e., the fluctuations originating from the compression stroke or sliding resistance of the piston relative to the rotation of the crankshaft, thereby making it

difficult for a person having a weak physical strength to start the internal combustion engine.

[0005] When a decompressor is attached to the internal combustion engine, it is possible to reduce the rope pulling force required for actuating the internal combustion engine. However, the provision of a decompressor leads not only to an increased complication of the structure of the device, and hence to an increase in manufacturing cost, but also to the release of unburned air-fuel mixture into the atmosphere and contamination of the environment.

BRIEF SUMMARY OF THE INVENTION

[0006] The present invention has been made to overcome the aforementioned problems. It is, in particular, an object of the present invention to provide a recoil starter that permits fluctuations of the rope pulling force to be reduced, thereby making it possible to perform a smooth rope-pulling operation and also to easily actuate the internal combustion engine, even by a person having a weak physical strength.

[0007] With a view to attaining the aforementioned object, there is provided, in accordance with the present invention, a recoil starter having a rotary driving member that is adapted to be rotated by pulling a recoil rope and an interlocking rotary member that is adapted to be rotated independently of the rotary driving member. A buffering spring is coupled between the rotary driving member and the interlocking rotary member. The buffering spring, which may be a torsion coil spring or a spiral spring, applies a rotational bias between the rotary driving member and the interlocking rotary member and is adapted to transmit the rotation of the rotary driving member to the interlocking rotary member.

[0008] In a preferred embodiment of the recoil starter according to the present invention, the rotary driving member

and the interlocking rotary member are disposed on a common rotational axis.

[0009] The rotary driving member is, preferably, a rope reel which is adapted to have the recoil rope wound thereon. The rope reel may have an annular cavity, in which case the buffering member is disposed inside the annular cavity of the rope reel.

[0010] In preferred embodiments, the interlocking rotary member is a power transmission pulley to which the rotation of the rotary driving member is transmitted through the buffering member. The recoil starter further includes a centrifugal ratchet mechanism coupled to the power transmission pulley and adapted to be coupled to a crankshaft of an internal combustion engine for transmitting the rotation of the power transmission pulley to the crankshaft of the internal combustion engine.

[0011] In preferred embodiments of the recoil starter of the present invention as constructed above, when the recoil rope (recoil handle) is pulled, the rope reel of the rotary driving member is caused to rotate, and the rotation of the rotary driving member is transmitted via the buffering member to the power transmission pulley of the interlocking rotary member. The rotation of the power transmission pulley is then transmitted via the centrifugal ratchet mechanism to the crankshaft of the internal combustion engine, thereby starting the internal combustion engine through the rotation of the crankshaft.

[0012] Since the buffering member is elastically compressed in the rotational direction of the rope reel when the recoil rope is pulled, the buffering member functions not only as a power transmitting member for transmitting the rotation of the rope reel to the power transmission pulley but also as a power reservoir and a cushion or a shock absorber, thereby making it

possible to minimize the fluctuations of the rope pulling force as much as possible.

[0013] Therefore, it is now possible with the recoil starter of the present invention to attain a smoother rope-pulling operation as compared with the conventional recoil starter, thereby making it possible to easily actuate the internal combustion engine, even for a person having a weak physical strength.

[0014] Furthermore, since the recoil starter according to the present invention can be constructed by simply disposing a buffering member such as a torsion coil spring in a cavity of the rope reel of a conventional recoil starter, the increases in total weight and in the manufacturing cost can be minimized. It may also not be necessary to provide a decompressor.

BRIEF DESCRIPTION OF THE DRAWINGS

[0015] FIG. 1 is a cross-sectional view illustrating one embodiment of the recoil starter according to the present invention;

[0016] FIG. 2 is a cross-sectional view taken along the line II-II in FIG. 1; and

[0017] FIG. 3 is a cross-sectional view taken along the line III-III in FIG. 1.

DETAILED DESCRIPTION OF THE INVENTION

[0018] The recoil starter 10 shown in FIG. 1 is adapted to be disposed close to one end portion 2a of the crankshaft 2 of an internal combustion engine 1, such as a small air-cooled two-stroke gasoline engine, and comprises a case 11 of two-piece structure, which is cylindrical as a whole in configuration so as to enable it to be attached to one side of the internal combustion engine 1. A rotary driving member 20, which is adapted to be rotated by pulling a recoil rope 25 by

means of a handle 22, is disposed inside the outer case 11a of the case 11 which is located remote from the internal combustion engine 1. An interlocking rotary member 30, which is adapted to be rotated independently of the rotary driving member 20, is disposed inside an inner case 11b.

[0019] More specifically, a supporting axle 12 projects distally toward the inner case 11b from the central portion of the outer case 11a. A rope reel 21 having the recoil rope 25 wound around it is rotatably fitted on a proximal portion of the supporting axle 12. A power transmitting pulley 31 is rotatably fitted on a distal portion of the supporting axle 12 for rotation independently of the rotation of the rope reel 21. A fastening screw 14 is threaded into the distal end of the supporting axle 12.

[0020] The axis of the supporting axle 12 as well as the rotational axes of the rope reel 21 and the power transmitting pulley 31 are coaxially aligned with the rotational axis O of the crankshaft 2 of the internal combustion engine 1. A torsion coil spring 15 functioning as a buffering member is disposed coaxially with the rotational axis O in a cavity S of the rope reel 21.

[0021] As shown in FIG. 2, the torsion coil spring 15 is constructed such that a hook portion 15a at one end of the torsion coil spring 15 and which is located close to the outer case 11a is hooked to a first locking portion 23 that projects from the rope reel 21. A hook portion 15b at the other end of the torsion coil spring 15 and which is located close to the inner case 11b is hooked to a second locking portion 33 that projects from the power transmitting pulley 31. A compression coil spring 36 that is engaged in slight compression between the power transmitting pulley 31 and a spring disk shoe 37 biases the torsion coil spring 15 toward the rope reel 21 along the rotational axis O.

[0022] A recoil spiral spring 27 is arranged between the outer case 11a and the rope reel 21 in such a manner that the outer end thereof is secured to the rope reel 21 and the inner end thereof is secured to a central portion of the outer case 11a in the same manner as that of the conventional recoil starter. Whenever the rope reel 21 is released after having been rotated to a desired extent by pulling out of the recoil rope 25, the recoil rope 25 is automatically rewound onto the rope reel 21 by the restoring force of the recoil spiral spring 27.

[0023] The interlocking rotary member 30 consists of the power transmitting pulley 31 and a centrifugal ratchet mechanism 40. As shown in FIG. 3, the centrifugal ratchet mechanism 40 comprises a pair of power transmitting protrusions 41, each projecting from the surface of the power transmitting pulley 31 which faces the internal combustion engine 1, and a clutch claw case 42, which is fixed to the end portion 2a of the crankshaft 2. The clutch claw case 42 is provided with a pair (for example) of starting claws 45, each pivotally supported by the clutch claw case 42. The starting claws 45 are normally urged inwardly (toward the rotational axis O) by means of a spring (not shown) so as to engage with the aforementioned pair of power transmitting protrusions 41. However, when the internal combustion engine 1 is started, the starting claws 45 are caused to rotate or pivot outward in the radial direction due to the centrifugal force produced by the rotation of the clutch claw case 42 as it is driven by the crankshaft 2, thereby permitting the starting claws 45 to disengage from the power transmitting protrusions 41.

[0024] In the operation of the recoil starter 10 of the embodiment, when the recoil rope 25 is pulled, the rope reel 21 of the rotary driving member 20 is caused to rotate in the direction P in FIG. 2. The rotation of the rotary driving

member 20 is transmitted via the torsion coil spring 15 to the power transmission pulley 31 of the interlocking rotary member 30. The rotation of the power transmission pulley 31 is then transmitted via the centrifugal ratchet mechanism 40 (the power transmitting protrusions 41 and the starting claws 45) to the crankshaft 2 of the internal combustion engine 1, thereby starting up the internal combustion engine 1 through the rotation of the crankshaft 2.

[0025] Since the torsion coil spring 15 is elastically compressed in the rotational direction of the rope reel 21 (in the direction P in FIG. 2) when the rope reel 21 is rotated by pulling out the recoil rope 25, the torsion coil spring 15 functions not only as a power transmitting member for transmitting the rotation of the rope reel 21 to the power transmission pulley 31, but also as a power reservoir and a cushion or a shock absorber, thereby making it possible to minimize, as much as possible, the fluctuations in pulling force of the recoil rope 25.

[0026] Accordingly, the recoil starter 10 of the embodiment provides a smoother rope-pulling operation as compared with the conventional recoil starter, thereby making it possible for even a weak person to easily start the internal combustion engine.

[0027] Furthermore, since the recoil starter according to the present invention can be constructed by simply disposing a buffering member, such as a torsion coil spring or a spiral spring, in a cavity of the rope reel of a conventional recoil starter, the increases in total weight and in the manufacturing cost can be minimized. Also, it may not be necessary to provide the internal combustion engine with a decompressor.

[0028] The embodiment of the present invention described above and shown in the drawings is intended to be exemplary.

Numerous variations and modifications of the exemplary embodiment can be made by those skilled in the art without departing from the spirit and scope of the invention as set forth in the accompanying claims.

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WHAT IS CLAIMED IS

1. A recoil starter, comprising
a rotary driving member that is adapted to be rotated by
pulling a recoil rope,
an interlocking rotary member that is adapted to be
rotated independently of the rotary driving member, and
a buffering spring coupled between the rotary driving
member and the interlocking rotary member, applying a
rotational bias between the rotary driving member and the
interlocking rotary member, and adapted to transmit the
rotation of the rotary driving member to the interlocking
rotary member.
2. The recoil starter according to claim 1, wherein the
rotary driving member and the interlocking rotary member are
disposed on a common rotational axis.
3. The recoil starter according to claim 1, wherein the
buffering member is a torsion coil spring or a spiral spring.
4. The recoil starter according to claim 2, wherein the
buffering member is a torsion coil spring or a spiral spring.
5. The recoil starter according to any one of claims 1 to 4,
wherein the rotary driving member is a rope reel which is
adapted to have the recoil rope wound thereon, the rope reel
has an annular cavity, and the buffering member is received in
the annular cavity of the rope reel.
6. The recoil starter according to any one of claims 1 to 4,
wherein the interlocking rotary member includes a power
transmission pulley to which the rotation of the rotary
driving member is transmitted through the buffering member and
a centrifugal ratchet mechanism coupled to the power
transmission pulley and adapted to be coupled to a crankshaft
of an internal combustion engine for transmitting the rotation
of the power transmission pulley to the crankshaft of the
internal combustion engine.

Attorney's Docket No.: A34202

DECLARATION, POWER OF ATTORNEY AND PETITION

I (We), the undersigned inventor(s), hereby declare that:

My residence, post office address and citizenship are as stated below next to my name,

I (We) believe that I am (we are) the original, first, and joint (sole) inventor(s) of the subject matter which is claimed and for which a patent is sought on the invention entitled

the specification of which

☒ is attached hereto.

☐ was filed on _____ as

Application Serial No. _____

and amended on _____.

☐ was filed as PCT international application

Number _____

on _____,

and was amended under PCT Article 19

on _____ (if applicable).

I (We) hereby state that I (We) have reviewed and understand the contents of the above-identified specification, including the claims, as amended by any amendment referred to above; that I (We) do not know and do not believe that this invention was ever known or used before my invention or discovery thereof, or patented or described in any printed publication in any country before my invention or discovery thereof, or more than one year prior to this application, or in public use or on sale in the United States for more than one year prior to this application; that this invention or discovery has not been patented or made the subject of an inventor's certificate in any country foreign to the United States on an application filed by me or my legal representatives or assigns more than twelve months before this application.

I (We) acknowledge the duty to disclose information known to be material to the patentability of this application as defined in Section 1.56 of Title 37 Code of Federal Regulations.

I (We) hereby claim foreign priority benefits under Section 119(a)-(d) of Title 35 United States

[illegible]

I hereby claim the benefit under Section 119(e) of Title 35 United States Code, of any United States application(s) listed below.

(Filing Date)

(Filing Date)

Status (pending,
patented,
abandoned)

Filing Date

I (We) declare further that all statements made herein of my (our) knowledge are true and that all statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

May 14, 2001

Date

Iunichi AKAIKE

NAME OF SECOND-JOINT INVENTOR

Iunich Akaike

Signature of Inventor

May 14, 2001

Date

Residence: Tokyo, Japan

Citizen of: Japan

Post Office Address:

4-9-23, Fujimicho, Chofu-shi,

Tokyo 182-0033 Japan

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